CLAIMS

1. A carbon nanotube array device comprising at least one nanotube tubule with a proximal and distal ends, said proximal end being attached to a substrate, further comprising a metallic material capable of providing a surface for binding biological compounds coated or adsorbed thereon.

2. The carbon nanotube array of claim 1 comprising at least one pair of aligned tubules positioned proximally on a substrate surface such that their distal ends are capable of being bridged by a material, rendering them electrically conducting.

3. The carbon nanotube array of claim 1 wherein the nanotube tubule is a single wall or a multi-walled carbon nanotube.

4. The carbon nanotube array of claim 1 wherein the metallic material comprises at least one metallic compound, an alloy or combinations thereof.

5. The carbon nanotube array of claim 1 wherein the metallic material is selected from the group consisting of gold, silver, platinum, copper, nickel, cobalt and aluminum.

6. The carbon nanotube array of claim 1 wherein the metallic material is gold.

7. The carbon nanotube array of claim 1 wherein the metallic material is located at the distal end of the nanotube tubule.

8. The carbon nanotube array of claim 1 wherein the metallic material is present as a surface coating on the carbon nanotube.

9. The carbon nanotube array of claim 1 wherein the metallic material is present as a particulate at the terminal end of the carbon nanotube.

10. The carbon nanotube array of claim 1 wherein the metallic material comprises a polymeric or glass bead wherein surface of said bead contains a metal deposited thereon.

11. The carbon nanotube array of claim 1 wherein the substrate is a metallic or non-metallic material.

12. The carbon nanotube array of claim 1 wherein the substrate is a electrically semi-conducting material.

13. The carbon nanotube array of claim 1 wherein the substrate is silicon.

14. The carbon nanotube array of claim 1 further comprising at least one biological compound wherein said biologically occurring compound immobilized on the surface of the metallic material of individual nanotubes comprising the said carbon nanotube array.

15. The carbon nanotube array of claim 1 further comprising at least one biological compound wherein said biological compound is capable of conducting electrical charge.

16. A carbon nanotube array of claim 15 wherein an electrical contact is established between at least two nanotubes in the said array by the surface immobilized biological compound.

17. The carbon nanotube array of claim 15 wherein the biological compound is immobilized on the surface of material via surface adsorption, ionic bonding, hydrogen bonding or covalent chemical bonding.

18. The carbon nanotube array of claim 15 wherein the biological compound is chemically derivatized to include a substituent selected from the group consisting of thiol, thiophenol, thiocarboxylic acid, carboxylic acid and disulfide.

19. The carbon nanotube array of claim 18 wherein the substituent is a thiol.

20. The carbon nanotube array of claim 15 wherein the biological compound is a nucleic acid, oligonucleotide, amino acid, enzyme, protein or derivatives thereof.

21. The carbon nanotube array of claim 15 wherein the biological compound is a chemically derivatized nucleic acid, amino acid enzyme, protein or a segment thereof.

22. The carbon nanotube array of claim 15 wherein the biological compound is DNA, RNA, or derivatives thereof.

23. The carbon nanotube array of claim 15 wherein the biological compound is single-stranded DNA, derivatized single-stranded DNA or segments thereof.

24. A molecular sensor device comprising:

a) a carbon nanotube array device comprising at least one pair of carbon nanotubes that are further comprise a metallic material;

b) a surface immobilized layer of at least one sensor agent deposited on said nanotubes so as to provide an electrical contact between said pair of carbon nanotubes, said electrical contacts being capable of conducting an electrical charge.

wherein said sensor agent is capable of interacting with a target species so as to produce a change in electrical conductivity of the said sensor device.

25. The molecular sensor device of claim 24 wherein the carbon nanotubes are single walled or multi-walled.

26. The molecular sensor device of claim 24 wherein the metallic material comprises at least a one elemental metal, a metallic alloy or combinations thereof.

27. The c molecular sensor device of claim 24 wherein the metallic material is selected from the group consisting of gold, silver, platinum, copper, nickel, cobalt and aluminum.

28. The molecular sensor device of claim 24 wherein the metallic material is gold.

29. The molecular sensor device of claim 24 wherein the metallic material is located at the distal end of the nanotube tubule.

30. The molecular sensor device of claim 24 wherein the metallic material is present as a surface coating on the carbon nanotube.

31. The molecular sensor device of claim 24 wherein the metallic material is present as a particulate at the terminal end of the carbon nanotube.

32. The molecular sensor device of claim 24 wherein the metallic material comprises a polymeric or glass bead wherein surface of said bead contains a metal deposited thereon.

33. A molecular sensor device of claim 24 wherein an electrical contact is established between at least two nanotubes in the said array by the surface immobilized biological compound.

34. The molecular sensor device of claim 24 wherein the biological compound is immobilized on the surface of material via surface adsorption, ionic bonding, hydrogen bonding or covalent chemical bonding.

35. The molecular sensor device of claim 24 wherein the biological compound is chemically derivatized to include a substituent selected from thiol, thiophenol, thiocarboxylic acid, carboxylic acid and disulfide.

36. The molecular sensor device of claim 24 wherein the substituent is thiol.

37. The molecular sensor device of claim 24 wherein the biological compound is a nucleic acid, amino acid enzyme or protein or derivatives thereof.

38. The molecular sensor device of claim 24 wherein the biological compound is a chemically derivatized nucleic acid, amino acid enzyme, protein or a segment thereof.

39. The molecular sensor device of claim 24 wherein the biologically occurring compound is selected from the group consisting of DNA, RNA, and derivatives thereof.

40. The molecular sensor device of claim 24 wherein the biological compound is single-stranded DNA, derivatized single-stranded DNA or segments thereof.

41. The molecular sensor device of claim 24 that is capable of sensing and detecting, microorganisms, viruses, toxins, proteins, nucleic acids, amino acids, enzymes and biologically active chemicals.

42. The molecular sensor device of claim 41 wherein the microorganisms are pathogenic bacteria, yeast or fungi.

43. The molecular sensor device of claim 42 wherein the microorganism is Bacillus anthtracis (anthrax).

44. A method of manufacturing a sensor device comprising at least one carbon nanotube comprising the steps of:

a) patterning the surface of a substrate with a catalytic material;

b) exposing patterned catalytic materials under conditions sufficient to cause individual carbon nanotubes to grow from the said catalytic materials to constitute an array;

c) depositing a metallic material on individual nanotubes; and

d) depositing at least one sensing agent on the metallic material coating such that the said agent bridges two or more individual nanotubes to permit electrical conduction between said nanotubes upon interaction of said sensing agent with a target species.

45. The method of claim 44 wherein said substrate material is an electrical semi-conductor or a electrical insulator.

46. The method of claim 44 wherein said substrate material is selected from the group consisting of silicon, germanium, silicon nitride, silica, alumina and quartz.

47. The method of claim 44 wherein the catalyst material is a metal, metal oxide, a metal alloy, an organometallic compound or mixtures thereof.

48. The method of claim 47 wherein the catalyst material is selected from the group consisting of nickel, iron, cobalt, molybdenum, tungsten, cobalt and mixtures thereof.

49. The method of claim 47 wherein the organometallic compound is ferrocene or nickelocene.

50. The metallic material of claim 44 wherein the metallic material is selected from the group consisting of gold, silver, platinum, copper, nickel, cobalt and aluminum.

51. The metallic material of claim 44 wherein the metallic material is gold.

52. The metallic material of claim 44 wherein the metallic material comprises a polymeric or glass bead wherein surface of said bead contains a metal deposited thereon.

53. The method of claim 44 wherein the metallic material is a metal alloy comprising nickel-gold or nickel-silver.

54. The method of claim 44 wherein the sensing agent is a biological compound.

55. The method of claim 54 wherein the biological compound is a nucleic acid, oligonucleotide, amino acid enzyme, protein or derivatives thereof.

56. The method of claim 54 wherein the biological compound is a chemically derivatized nucleic acid, amino acid enzyme, protein or a segment thereof.

57. The method of claim 54 wherein the biological compound is selected from the group consisting of DNA, RNA, and derivatives thereof.

58. The method of claim 54 wherein the biological compound is single- stranded DNA, derivatized single-stranded DNA or segments thereof.

59. A method of manufacturing a sensor device comprising at least one carbon nanotube comprising the steps of:

a) patterning the surface of a substrate with a catalytic material;

b) exposing patterned catalytic materials under conditions sufficient to cause individual carbon nanotubes to grow from the said catalytic materials to constitute an array;

c) depositing a metallic material on inorganic or organic beads;

d) depositing at least one sensing agent on the metallic material containing beads; and

e) immobilizing the beads containing sensing agent and metallic material to individual carbon nanotubes said agent bridges two or more individual nanotubes to permit electrical conduction between said nanotubes upon interaction of said sensing agent with a target species.